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September 7, 2006

TO: **Bruce A. Chernof, M.D.**
Director and Chief Medical Officer

Jon W. Fullinwider
Chief Information Officer

Dave Lambertson
Director, Internal Services Department

FROM: **John R. Cochran, III**
Chief Deputy Director 

SUBJECT: **REPORT OF VOIP SITE VISIT TO NORTHWESTERN
UNIVERSITY MEDICAL CENTER**

Attached is the final report that discusses the findings of the site visit team from the Department of Health Services (DHS), Internal Services Department (ISD), and the Chief Information Office (CIO) to Northwestern University Medical Center (Northwestern). Although this document was reviewed by the respective participants and their comments incorporated, DHS takes total responsibility for its content.

Our site visit was extremely productive. It demonstrated the value of VOiP technology in a sophisticated and complex healthcare environment. The DHS staff came back from this visit excited for the potential the technology offers our facilities to provide contemporary communications technology which can add new features as the healthcare environment adapts this technology to the hospital setting.

As you are aware, hospitals have not been on the leading edge of technology adoption in areas where potential concerns about 24x7x365 availability are involved. Of the more than 5,700 licensed hospitals in the U.S., a small number were identified in your research and the research conducted by CISCO that had actually installed a VOiP solution. In Patrick Anderson's conversation with Gartner's VOiP expert, he noted that hospitals across the country have been very slow to adopt this technology and for the most part are in the planning stage. Northwestern, widely recognized for leading the hospital industry in technology adoption, only deployed VOiP in their clinical nursing areas in the past 12 months, despite having been evaluating and working on it for more than 7 years. We received the benefit of their many years of experimentation, testing, evaluation and implementation as a result of our site visit.

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Patrick Anderson and I fully support the deployment of VOiP voice technology at LAC+USC, incorporating the critical success factors learned from our site visit and research. The site visit report also reflects the recommendations made by the Northwestern and CISCO VOiP hospital technology staff on the steps necessary for LAC+USC to have a successful install and operation of VOiP. We plan on developing a plan which reflects these components with ISD and the CIO and to proceed with completing the telecommunications plan for the LAC+USC complex.

If you have any questions, please call me.

JRC:jrc

Attachment

c: Patrick Anderson
Pete Delgado

Technology Evaluation Department of Health Services Voice Over IP – LAC-USC Medical Center

Executive Summary and Recommendation

The Department of Health Services recognizes the functionality of VOIP and recommends the technology be deployed across the DHS enterprise subject to the critical success factors for the successful deployment of the technology. The ISD VOIP engineering team and the LAC+USC I.T. leadership must work together to incorporate the 13 critical success factors into the planning, architecture, and ongoing operational component of the VOIP project. If that is done, our visit confirms that VOIP can be effectively used in a complex, multi-building hospital environment.

Objective of Evaluation:

Deploy a cross functional team from the County of Los Angeles to identify an academic hospital comparable to the LAC+USC Medical Center in terms of number of beds and volume of patients that has successfully deployed VOIP. Perform on site validation and first hand review of the technology. A thorough review included the following:

- Evaluation of reliability
- Evaluation of functionality
- Evaluation of cost effectiveness
- Evaluation of lessons learned including the documentation of the critical success factors for implementation and ongoing operations.

Evaluation Team:

- John Cochran – Chief Deputy Director, DHS
- Patrick Anderson – Chief Information Officer, DHS
- James Yu – I.T. Manager, LAC+USC Medical Center
- Rosie Jones - Telecommunications Manager, DHS
- Dennis Shelley – Associate CIO, County of LA
- Robert King – Manager, Premise Systems Division, ISD
- Henry Kao – VOIP Project Manager, ISD

Date, Location and Point of Contact for Evaluation:

- August 30, 2006
- Northwestern Memorial Hospital, Chicago, Illinois
- Dwayne Moehl, Project Director, Information Services

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EVALUATION

Comparable Hospital Selection

The DHS team members reviewed several potential hospital environments for this evaluation. These hospitals included,

- VA Portland, Oregon,
- Yavapai Regional Medical Center, Prescott, Arizona
- Northwestern Memorial Hospital, Chicago, Illinois
- First Health of the Carolinas, Pinehurst, North Carolina
- Exempla Healthcare, Denver, Colorado.

Northwestern Memorial Hospital was selected because this hospital is the primary teaching hospital for Northwestern University's Feinberg School of Medicine with 544 primary care beds and 167 beds in the Women's Hospital. The medical school also has other care facilities with additional beds. It is the largest birthing center in the state with nearly 10,000 births annually. The emergency department is a Level 1 Trauma Center which treated over 70,000 patients last year. The Medical Center has approximately 6,500 employees including a medical staff of 518 residents and 125 fellows.

The other hospital environments were not comparable to LAC+USC resulting in the selection of Northwestern Memorial Hospital.

Review of the Technology Decision by Northwestern Memorial

Northwestern is very similar to LAC USC Medical Center in that they used Centrex from the phone company (AT&T). Northwestern spent 7 years evaluating the new VOIP technology to replace Centrex. The replacement goals were:

- a) Replace Centrex: cost of Centrex was escalating for both voice and voicemail.
- b) Studied Centrex reliability: although never had system wide outages, had constant loss of individual service to individual phones.
- c) Goal was to have information for staff anytime and anywhere, not just at fixed sites.
- d) Wanted to eliminate 1-2 week delays in getting Centrex moves-adds-changes performed by AT&T the local telephone carrier.
- e) Wanted an integrated single vendor solution vs. best-of-breed multi vendor solution for reliability and single response – no "finger pointing" about whose parts didn't work.

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Northwestern also felt that the Centrex offering did not provide for new functionality and VOIP is adding new functionality at a consistent rate. Northwestern issued RFP in 2002 for VOIP system. They performed research and vendor comparisons and chose Cisco because of their market share and unique capability to leverage the data network with more advanced functionality and reliability than other vendors which included Avaya as the runner up. Northwestern also wanted a technology that was scalable and they believe that Cisco will meet that significant requirement as Northwestern is experiencing significant growth.

Review of the Operational Component

The review of the operational component consisted of working with the Hospital VOIP engineering team and with the executive I.T. management team. We discussed the reliability, functionality, cost effectiveness, and lessons learned. The lessons learned section had significant insight for the County team in terms of learning first hand about critical success factors. These factors should be the primary action items as a result of this evaluation.

Evaluation of the reliability of the VOIP system

Prior to the VOIP implementation at Northwestern, the engineering group was incurring approximately 300 tickets per month for voice outages within the enterprise. After the VOIP implementation the team is incurring approximately 15 voice outages per month. The reliability according to the engineering team has increased significantly.

The engineering team did state that there were some issues at start up that would have been avoided if a test environment was available prior to deployment as integration with voice mail for campus partners did fail. Rigorous change management also contributes to high availability as all changes to the environment are reviewed, tested, and recovery plans are documented. All technicians are also aware of all changes to assist with fault isolation and resolution. The nurses on a medical ward and the nursing supervisor and ward secretary also reported no reliability issues. At each clinical area, a red phone is installed using a local PBX for emergency internal communications. Since they cut over to VOIP in July 2006, they have not had to use the emergency phone.

The engineering team stated that their high degree of reliability is due to the redundant hardware eliminating all single points of failure at the server, storage, switch and power supply level. Northwestern built 3 complete VOIP server locations so that if any one location failed, they had 100% redundancy in the other two locations providing failover. Further, the team noted that multiple phone company central office points of entry are also required to ensure critical success. Implementing a program of 24 x 7 monitoring of the systems to identify early

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indicators of problems and intervention with urgency is critical to maintain high availability of the systems. Migrating from a multi-vendor data solution to a single vendor solution for a voice and data network system also contributed significantly to the reliability. Northwestern was working with 3Com, Cisco, Cabletron, and Checkpoint to manage the infrastructure prior to the single vendor solution from Cisco. This single vendor solution allows for better integration and more complete monitoring resulting in overall reliability. The up-front planning around the human workflow is also very important. The workflow study needs to occur for each department prior to deployment to ensure critical processes are not broken which could result in a work slowdown or work stoppage. One solution is to have a branding campaign and initial training of supervisors and management and ask them to consider workflow implications and then have the deployment team further analyze the input from the supervisors and management. The workflow and dial plan/profile setup is a critical success factor. Comprehensive user training is also a factor. Both Cisco and Northwestern recommended that a Cisco top tier integrator with their proven processes be utilized for infrastructure implementation and setup.

Evaluation of the functionality of the VOIP system

Northwestern is very happy with the current and future functionality of the Cisco VOIP telephony solution. Today the largest benefit is from the nurse station ability to “park” a call and page the nurse with “call park” number who can pick up the call from anywhere within the hospital. This has a significant time savings impact on the ward nurses and the ward secretary. The secretary stated that her call handling time has been cut in half as she does not have to follow up with nurses to ensure they get the calls. Northwestern is also expanding the use of the integration with the wireless access points. Doctors are piloting using the Cisco wireless phone which allows them integration with the telephone at all times. The features include; push to talk and clinician paging. The physicians and nurses will not have to leave the patient to communicate with peers and nurse stations. This wireless integration will also allow for patient charting at virtually all locations with the addition of the Mobile Access solutions that integrate with the wireless access points. This solution improves wireless access by 35%.

Evaluation of the cost effectiveness of the VOIP system

Northwestern was able to immediately see a return on investment simply by migrating the voice mail boxes of 6,000 users from Centrex to the VOIP Voice Mail system. This saved about \$40,000 per month. The cost of vendor support for moves, adds and changes significantly eliminated with the implementation of VOIP. Overall, they achieved cost reduction on the support of Centrex telephone system of \$1.0 million per year. Northwestern was able to deploy VOIP on budget and they have met their ROI targets.

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Evaluation of the lessons learned of the VOIP system

The Northwestern team shared their experience in the areas of critical success factors which they strongly urged the County engineering team to consider:

- Rigorous change management including a separate test environment.
- Redundant hardware— single points of failure eliminated
- Top tier integrator professional services for implementation
- Multiple phone company central office points of entry
- 24 x 7 monitoring and staffing in a network operations center
- Voicemail integration analysis with campus partners (medical school)
- Single vendor solution
- Workflow analysis and design prior to implementation at the unit level
- Supervisor training
- User training
- Deploy VOIP in phases, first to IT, administration next and finally clinical areas
- Establish a Network operations Center to monitor, maintain and repair VOIP system at a level equal or better than current vendor
- No new technology gets deployed to a clinical area or new building before full test and acceptance in existing buildings